

# The Boston Medical and Surgical Journal

## TABLE OF CONTENTS

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### ORIGINAL ARTICLES

THE ADMINISTRATION OF ARSPHENAMINE. By Albert S. Hyman, M.D., Boston. . . . .	353
TORSION OF THE OMENTUM. By Edw. H. Riley, M.D., Boston. . . . .	362
SURGICAL TREATMENT TO PREVENT AND MINIMIZE PERMANENT DISABILITIES. By Francis D. Donoghue, M.D., Boston. . . . .	364
A CASE OF ASSOCIATED PAINS IN THE KNEE AND PENIS. By Herman W. Marshall, M.D., Boston. . . . .	367
GASEOUS EXCHANGE WITH UNPRACTICED SUBJECTS AND TWO RESPIRATORY APPARATUS EMPLOYING THREE BREATHING APPLIANCES. By M. F. Hendry, T. M. Carpenter, and L. E. Ames, Boston. (Concluded.) . . . . .	368
BOOK REVIEWS	
The Stethoscope in Ophthalmology, with Especial Reference to the Treatment of Heterophoria and Heterotropia. By David Wells, M.D., F.A.C.S. . . . .	371

The Diagnostics and Treatment of Tropical Diseases. By E. R. Sitt, A.B., M.D. . . . .	371
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### EDITORIALS

VITAL STATISTICS OF ENGLAND AND WALES, 1901-1910. . . . .	372
WAR ACTIVITIES OF THE UNITED STATES PUBLIC HEALTH SERVICE. . . . .	373
TETANUS IN BRITISH MILITARY HOSPITALS. . . . .	373
MASSACHUSETTS STATE DEPARTMENT OF HEALTH. . . . .	374
MEDICAL NOTES. . . . .	375

### CORRESPONDENCE

NURSES FROM WALTHAM TRAINING SCHOOL. Frank M. Sherman. . . . .	378
HADJUM TREATMENT. James Broten Thornton. . . . .	378

### MISCELLANY

NOTICES, RECENT DEATHS, ETC. . . . .	378
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## Original Articles.

### THE ADMINISTRATION OF ARSPHENAMINE.

BY ALBERT S. HYMAN, M.D., BOSTON,

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[From the Venereal Service of the Long Island Hospital.]

THE increasing use of arsphenamine in the treatment of the spirochetotic diseases is filling medical literature with reports of many grave<sup>1</sup> and occasionally fatal<sup>2</sup> sequelae associated with or directly following the administration of this drug. These reports have been issued with such an alarming frequency that it is not without a growing apprehension that the conscientious practitioner continues to use one or another of the various preparations that are dispensed under the name "arsphenamine."

The condition is apparently much the same in all of the scientifically active countries. Attempts at standardization of the process and inquiries into the nature of the reactions following the use of arsphenamine have been made by able investigators of many lands. From Paris comes the recent study of the eminent French syphilologist, Dr. G. Milian.<sup>3</sup> Even the Germans, though they possess the original salvarsan process, are not without their diffi-

culties. In October of 1918, Professor Hoffman, the successor of Paul Ehrlich, was selected by the *Allgemeine ärztliche Verein*<sup>4</sup> to study the untoward effects of the drug.

In this country, the U. S. Army Medical Department with its enormous clinical opportunities and demands soon felt the need of a standardized process. Accordingly, there was issued from the office of the Surgeon-General a manual for the treatment of venereal diseases.<sup>5</sup> Apparently this compendium failed in some of its promises, for a little later there appeared a supplement<sup>6</sup> which modified at some length the procedure of the former.

With the cessation of war activities, the arsphenamine problem was naturally taken over by the Public Health Service, and only recently McCoy<sup>7</sup> has issued a circular describing the standardized process of this department; McCoy's statements<sup>8</sup> have been too emphatic to meet with the unanimous approval of the clinicians<sup>9</sup> using the drug.

The arsphenamine problem is thus far from being solved and the practitioner views with confusion the multitude of "standardized processes" and the diversity of opinion held by the investigators of this specific drug.

In brief, the arsphenamine problem, so called, is concerned with the reactions following the use of this drug and the proper method of ad-

ministering it in order to reduce or, if possible, to eliminate these reactions.

In an analytical review of 500 doses of arsphenamine given at the Long Island Hospital, we have been able to obtain what we believe are impressive clinical data in regard to the disagreeable complications following the intravenous administration of the drug. The attempt to classify these complications is perhaps not without value, for in so doing we may appreciate more readily the lines of prophylaxis and treatment to be followed.

The French investigators<sup>3</sup> describe two types of reaction—an inconstant “nitritoid” reaction which is closely allied to anaphylactic phenomena following the introduction of a foreign protein into the body and an intolerant arsenic reaction. In this country, Sargent<sup>10</sup> has defined two reaction groups which he calls “vasoparetic” and “gastro-intestinal.” Finally, Beechson<sup>11</sup> describes another type of the nitritoid reaction, which he believes is due to suprarenal insufficiency.

In our 500 doses we have seen 58 reactions, or a general average of about 11.6% (see table I). In analyzing each group of 100 doses, we have had 21% reactions in the first 100; 15% in the second; 11% in the third; 6% in the fourth; and 5% in the fifth. This remarkable decrease in the percentage of reactions we believe to be due to the application of principles developed from an intensive study of the reactions occurring in the first 100 doses.

We have found it convenient to divide the reactions into four general clinical groups, depending in some part upon the time of their manifestation after the reception of the drug.

The first group shows an immediate reaction to the intravenous injection of the solution and is indicated by an increasing congestion of the blood vessels of the face and neck. The patient becomes cyanotic and complains bitterly of a peculiar, oppressive sensation in the chest, particularly under the sternum. The congestion is sometimes tremendous and startling; the dyspnea increases; and the patient cries out as though in agonizing fear. In a few minutes, however, the congestion gradually subsides, the respirations are easier, and the patient is apparently none the worse for his “ordeal,” and ordeal it is, for usually the patient will refuse subsequent intravenous treatments because of their apprehensive character.

This immediate type of reaction occurred in about 1% of our cases (see table I); the patients were men and women of the so-called

TABLE I. SHOWING THE NUMBER AND PERCENTAGE OF REACTIONS IN EACH CLASS OCCURRING IN FIVE SERIES OF CASES, EACH CONTAINING 100 DOSES OF ARSPHENAMINE.

SERIES	CLASS I		CLASS II		CLASS III		CLASS IV		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%
100	4	0.8	15	3.0	2	0.4	0	0	21	4.2
200	2	0.4	11	2.2	1	0.2	1	0.2	15	3.0
300	0	0	11	2.2	0	0	0	0	11	2.2
400	0	0	6	1.2	0	0	0	0	6	1.2
500	0	0	5	1.0	0	0	0	0	5	1.0
Total	6	1.2	48	9.6	3	0.6	1	0.2	58	11.6

“plethoric disposition” type and for this reason we believe that most, but not all, of their symptoms were due to the physiological effect produced by increasing the fluid circulating medium in a system already carrying an excess burden. That this is actually the case we were able to demonstrate in the following way. Patients who were known to react in this immediate fashion were given 200 c.c. of normal salt solution intravenously. In order to eliminate psychological influences so far as possible, the salt solution was given by the same apparatus and under exactly the same conditions as their previous dose of arsphenamine. All of the patients reacted to this increase in the circulating medium but showed symptoms to a somewhat lesser degree than when arsphenamine was used. Injection of arsphenamine on a subsequent day would cause the violent symptoms already described.

We have concluded from these facts that the immediate reaction to arsphenamine when injected intravenously is due for most part to the physiological response of the circulating system to an increase in its fluid content. The additional factor is the effect of arsphenamine itself, and this we believe is directly dependent upon its method of preparation, later to be described.

If this immediate reaction is merely a mechanical one, it should easily be prevented by considering the hydrostatic problem involved. In other words, if we lessened the volume of blood by the quantity of fluid that we are to inject, there should be no serious change in the circulating system. This has proved to be the case; patients showing this type of reaction are first bled from 150 to 200 c.c. of blood, and then the arsphenamine solution is injected through the same needle. The success of this method is graphically shown in table I.

Another way of lessening the volume of fluid is by increasing the apparent size of the circulating system itself. This should be readily accomplished pharmacologically by the use of vaso-dilators, which would not only increase the size of the system but would also increase the probability of absorbing the drug by carrying the arsphenamine solution to the remote parts of the body. Theoretically, then, this should be a better method than the actual loss of blood described above.

Working upon this hypothesis, Barnes<sup>2</sup> has recently suggested the use of nitroglycerine and other drugs of the nitrite series as a remedy of the post-administrative complications of arsphenamine therapy.

On the other hand, Cushny<sup>13</sup> believes that these drugs are unnecessary; he recorded from his experiments that under the influence of arsenic the capillaries permit the passage of fluid into the tissues more readily than normal, and that the arsenic-bearing compounds are efficient vaso-dilators. Finally, we have to consider the results of Milian's investigations;<sup>14</sup> and here we are presented with a diametrically opposed line of thought. Milian believes that the post-administrative complications of arsphenamine are due almost entirely to the extreme vaso-dilating effect of this drug, and he advocates the use of vaso-constrictors as a remedy for the condition.

Beebson<sup>15</sup> arrived at this conclusion from his experimental work with arsphenamine and he concludes that epinephrin is the drug par excellence for the extreme vaso-dilation which he observed. Stokes<sup>14</sup> believes atropin will protect against the acute reactions.

Whatever may be the specific effect of arsphenamine upon the blood vessels, we have found that the results from a compensating drug therapy have been inconstant and almost without value, yet the same patients treated with a pre-administrative decrease of blood volume have shown a significant lessening of symptoms, and clinically we believe it to be the treatment of choice for this type of reaction.

The second type of reaction which may follow the use of arsphenamine develops within the first twenty-four hours after the reception of the drug. It may start within twenty minutes but the majority of our cases have occurred from three to eight hours after the injection. The patients present nausea of varying severity,

vomiting, severe throbbing frontal headache, vertigo, hyperpyrexia, occasionally severe abdominal pains, and pains throughout the bones and joints. A sudden diarrhea is common. The urine is usually increased in volume and has a specific gravity which is higher than its volume would indicate; traces of albumen and a few casts are commonly found, but of great significance is its reaction, which is almost invariably *alkaline*. The symptoms increase in severity for about two to six hours and then gradually clear up, leaving the patient weakened but not seriously affected.

This is the most common reaction following the use of arsphenamine and its occurrence has been recorded by many observers. We had 48 such cases, representing about 9.6% reaction; in other words, one person in ten will react in this fashion. This agrees with the figures of other large syphilitic clinics.

The treatment of this type of reaction depends upon the conception of the factors involved in its production, and these we believe are directly concerned with the preparation of the drug for intravenous use. In the following pages we shall attempt to demonstrate that the reaction is essentially a manifestation of *alkalosis*, and can be successfully treated on this basis.

Supportive treatment is also important. We have found that those patients who have been prepared for the injection by having pre-operative purgation, nothing but liquids by mouth, and rest in bed for 24 hours after the injection, have suffered less than those not so prepared.

The third type of reaction is not common; in our series we had three cases, or 0.6%. It is shown by those patients who present an alleged idiosyncrasy or intolerance toward the arsenical compounds. This reaction has been described as a sub-acute or delayed arsenic poisoning which develops a well-known clinical picture. Several days, or possibly weeks, after an injection of arsphenamine the patient begins to grow gradually weaker, the appetite is lost, vague and shifting pains are complained of; a severe diarrhea, occasionally constipation, occurs. The patient suffers from an increasing gastritis, with uncontrollable nausea and vomiting. Hematemesis is not uncommon in severe cases. The liver dulness is said to decrease, although our cases have not shown this feature. There may be jaundice. The urine is usually

scanty, high colored, with traces of albumin and hyalin casts. Bile and blood cells are found. One occasionally finds traces of sugar.

The cutaneous manifestations are probably the most interesting. One of our cases, which terminated fatally, showed small petechial spots over both thighs and abdomen; these spots grew larger, were exceedingly painful, and after attaining the size of a silver 25-cent piece gradually disappeared after showing the various color changes of absorbing blood pigment. This patient, a woman of 38, had received one dose (0.4 gm. arspenamine) and developed symptoms in five days. Her nausea and vomiting persisted for about a week, leaving her greatly weakened. A few days later the purpuric spots developed and then gradually increasing jaundice. Death occurred six weeks after the administration of arspenamine. The post-mortem findings were consistent with an arsenic poisoning. There are about ten other such cases reported in the literature and all show essentially the same findings.<sup>2</sup>

Our other cases (two in number), after developing a more or less diffuse purpuric rash accompanied by a severe gastro-intestinal upset, gradually cleared up under supportive treatment.

The fourth type of reaction, the so-called Herxheimer reaction, we have seen in only one of our cases, due, perhaps, to the fact that our clinic consists of young adults, and few of our patients are over 50 years of age. The one case referred to was a tabetic of 58 who presented alarming cerebral symptoms for four days, and then cleared up.

Under these four types, then, we believe that the complications following the administration of arspenamine can be classified. As for the prophylaxis and treatment of the last two, we have learned little or nothing from our work. Fortunately the first two classes are the most common and we feel that these disagreeable complications may be entirely eliminated or greatly reduced by observing certain important factors. The mechanical or hydrostatic principle has already been described; there is left now to be considered the actual administration of the drug.

## II.

### THE ADMINISTRATION OF ARSPENAMINE.

There are two distinct procedures concerned in the actual administration of arspenamine:

First, the preparation of the drug for intravenous use; and secondly, the injection of the solution into the vein.

### THE PREPARATION OF ARSPENAMINE FOR INTRAVENOUS USE.

Arsphenamine is the official trade name of several compounds which bear more or less resemblance to the original formula of salvarsan as described by Ehrlich.<sup>15</sup> The complexity of the process of manufacture and the chemical instability of the drug itself have caused many variations in the final product, so much so that it is a notorious fact that physicians find it almost impossible to obtain two samples of the drug that are alike, either in their physical or chemical behavior. Even samples of the same brand will vary to a marked degree.

Clinicians have long fretted over the variations of solubility of the drug in water. The color of the dissolved drug is different for each preparation, although made up under similar conditions. The H-ion concentration of the different preparations varies tremendously, and for this reason, if for no other, the previous attempts to standardize the preparation of the drug for intravenous use have failed.

It is impossible to calculate or even predict with any accuracy the amount of alkali required to neutralize a given solution of dissolved arspenamine and to redissolve the precipitate which forms. Manufacturers of the drug realize this fact, and yet they are required to give explicit directions for preparing the solution. They must needs be evasive as to the amount of alkali that should be added, leaving it to the experience and judgment of the user to determine the degree of alkalinity to be attained. To quote from one trade circular, "An excess of alkali is to be avoided, as it may produce local disturbance. The solution must under no conditions be acid, because that would mean increased toxicity."<sup>16</sup>

Other manufacturers tell us to add sodium hydroxide until the solution is alkaline to litmus,<sup>17</sup>—a confusing statement when the solution becomes alkaline to litmus long before the precipitate redissolves, as is not infrequently the case.

The clinician is usually activated by one thought—to redissolve the precipitate and obtain a clear solution. He therefore continues to add alkali until the solution becomes clear. He would be startled and not a little uneasy if he



really knew the alkalinity of the solution which he intends to inject into the veins of his patient. Titration experiments have shown us that solutions so made up are usually 16 to 18 times as alkaline as an equal volume of blood, and some solutions run as high as 40 times.

Investigators of the post-administrative reactions from arsphenamine have apparently ignored this fact and have looked otherwise for the source of trouble. For example, Thompson<sup>18</sup> believes that the chills and fever which follow the injection of arsphenamine are due to the subnormal temperature of the solution used, and he has devised an apparatus for keeping the solution at body temperature. Temperature, however, can be only a small factor in the immediate type of reaction, and surely has nothing to do with reactions developing some hours after the reception of the subnormal solution.

Rieger<sup>19</sup> claims that commercial arsphenamine decomposes to form an arseniureted methyl compound which is the cause for most reactions.

Jackson and Smith<sup>20</sup> have done exceptional work in this field. They examined many intermediary compounds occurring during the process of manufacture of arsphenamine and they concluded that these compounds were not very poisonous and in no way could account for the variable toxicity of the different samples of arsphenamine. Their experimental work showed that the reactions were first indicated by a dilatation of the right side of the heart, with an increasing pulmonary pressure and a slow fall of the systemic pressure. The cause of the rise in the pulmonary arterial pressure they believed might be explained by the alkalinity of the solution used, and partly to a specific effect of the drug itself.

If a strongly alkaline solution is injected into a man's veins, he soon has difficulty in breathing, complains of a sub-sternal pressure, and shows alarming signs of collapse. He soon recovers from the immediate violent symptoms and then develops nausea, vertigo, vomiting, headache, hyperpyrexia, malaise, and vague and shifting pains. He will have diarrhea and complain of thirst. Harrop<sup>21</sup> injected a concentrated solution of sodium bicarbonate into the veins of a patient whom he was treating for corrosive sublimate poisoning and found the symptoms enumerated above to follow the use of such an alkaline solution.

If, then, intravenous injections of hyperal-

kalin solutions can cause such reactions, may not the condition which follows the use of arsphenamine be due entirely to a similar condition which has recently been described as *alkalosis*?<sup>22</sup>

*Alkalosis* is a relatively new word used to explain a condition of disturbed chemical balance in the body fluids, apparently the opposite of *acidosis*. It means an increase in the alkali content of the blood stream particularly, and occurs in a few ill-defined pathological conditions.

The urinary findings in alkalosis are significant. The urine is alkaline, the specific gravity is high, and the normal volume is increased. McLeod and Knapp<sup>23</sup> discovered that lactic acid appeared in the urine when alkalosis was produced by injecting hyperalkaline solutions intravenously.

Table II represents a series of urines from patients who showed post-administrative reac-

TABLE II. URINARY EXAMINATION IN TWENTY CASES SHOWING POST-ADMINISTRATIVE REACTIONS.

PATIENT	I. BEFORE INJECTION			II. AFTER INJECTION			LACTIC ACID
	24-hr. vol.	Reaction	Sp. g.	24-hr. vol.	Reaction	Sp. g.	
1	830	acid	1012	960	alkaline	1024	0
2	1120	acid	1006	1230	alkaline	1021	0
3	940	acid	1008	1054	alkaline	1019	+
4	880	acid	1017	896	alkaline	1027	+
5	640	acid	1012	1090	alkaline	1021	+
6	1010	acid	1010	1090	alkaline	1020	+
7	1254	acid	1008	1254	acid	1012	++
8	960	neutral <sup>1</sup>	1012	988	alkaline	1022	++
9	872	acid	1021	1056	acid	1024	+
10	950	acid	1016	1180	acid	1022	+
11	840	acid	1008	978	alkaline	1021	+
12	680	acid	1024	990	alkaline	1027	+
13	710	acid	1016	880	alkaline	1025	0
14	714	acid	1014	1120	alkaline	1019	++
15	800	acid	1021	1040	alkaline	1024	0
16	610	acid	1022	878	alkaline	1020	+
17	786	acid	1014	1108	alkaline	1018	+
18	940	acid	1020	1340	alkaline	1021	0
19	820	neutral	1014	1010	alkaline	1024	+
20	1180	acid	1007	1224	alkaline	1026	++

tions. The urines were collected for 24 hours before and after the injection, and the volume, reaction, specific gravity, and the presence of lactic acid were determined. The figures are striking. Nearly every urine was alkaline, increased in volume, and of a higher specific gravity. The test for lactic acid was positive in 15 out of the 20 cases.

We believe that these figures tend to indicate that the reactions which follow the intravenous administration of arsphenamine are merely manifestations of what may be called "acute alkalosis" due to the hyperalkalinity of the solution

used and that the specific effect of the drug itself plays but a minor rôle in the reaction.

The remedy is apparently simple. It means a reduction in the alkalinity of the solution used. It means not greater care on the part of the physician in preparing the solution, for he must use sufficient alkali to obtain a clear solution, regardless of its concentration, but it means the preparation of a compound by the manufacturers which is less acid and which will require a less alkaline solution for its administration.

We can further aid in preventing these disagreeable reactions by treating the alkalosis symptomatically. Wilson<sup>24</sup> has demonstrated that the administration of acids will relieve the condition. Our experience has shown us that patients developing these reactions are promptly relieved by feeding them with acid substances. The juice from the citrus fruits, vinegar salads, pickles, other sour foods, sodium acid phosphate, etc., can be given. We have found that the urine is a perfect index of the condition. A change from alkaline to acid reaction of the urine usually means a cessation of symptoms. It is interesting to point out at this time that the urine of patients who have received arsphenamine and who do not show reactions is invariably acid. We have very carefully followed the urines of over 400 cases which have shown no reactions and have found every one to be acid, and to show no changes either in specific gravity or volume.

In brief, then, we believe that the post-administrative reactions which follow the use of arsphenamine are due for most part to alkalosis induced in susceptible persons by hyperalkaline solutions of arsphenamine and that the condition can be greatly relieved by the production of a less acid arsphenamine and by adding to the body acid equilibrium when the symptoms of alkalosis develop.

#### THE INTRAVENOUS INJECTION OF ARSPHENAMINE.

Solutions may be introduced into a vein either by squirting or by pouring. A solution is squirted or forced into a vein with the aid of a pump or syringe; it can be poured into a vein by allowing the principles of gravity to come into play. Both of these methods have been employed by clinicians administering arsphenamine.

Ehrlich's original procedure described the

use of a glass pump, but the tendency in recent years seems to show a gradual discarding of the pump method in favor of the gravity method. The latter method has the advantage of maintaining an even pressure which can be regulated with great exactness: there is less danger of air leakage with the possibility of air embolism, and finally it reduces the number of persons engaged in the operation and thus reduces potential sources of trouble. Indeed, the superiority of the gravity method is well summarized in the statement of Milian that the syringe is responsible for certain fatalities that might have been avoided by pouring instead of squirting the fluid into the vein.<sup>25</sup>

Arsphenamine can be administered in two ways: alone or together with physiological salt solution. There seems to be great difference of opinion among those who administer the drug as to which is the better method. Nelkin<sup>26</sup> reports that in a large series of cases in which no salt solution was used he had no greater percentage of reactions than in other large clinics where salt solution was employed as a routine measure. On the other hand, the careful experimental work of Danyasz<sup>26</sup> on rabbits seems to show that physiological salt solution is indispensable in the successful administration of arsphenamine.

Our own work upon this subject has convinced us that salt solution will diminish and even prevent some of the reactions which follow arsphenamine. For example, a series of 50 doses of arsphenamine were given without salt solution, and on subsequent weeks the same patients received salt solution with arsphenamine. In order to eliminate errors of preparation, the patients were divided into two groups, one-half of whom received salt solution, while the other half received straight arsphenamine from the same solution of the drug.

Of the 50 doses unaccompanied by salt solution 20 showed characteristic reactions, while of the 50 doses accompanied by salt solution only four showed reactions. In other words, the administration of physiological salt solution with arsphenamine in our experiment lowered the reaction rate from 40% to 8%, making the preparation one-fifth as toxic. It thus seems to us that there is a very definite indication clinically for the use of salt solution.

There have been many types of apparatus

devised for the injection of arsphenamine and salt solution, and there is need for these different methods for they are applied to different requirements. The physician who gives but one injection does not require the apparatus which a man who gives 10 injections is forced to employ. Likewise a special apparatus finds its need in clinics which administer 20 doses at one time. Finally the large clinics that give over 20 doses must consider an apparatus which will economize their time, attendants, drugs, etc., as far as possible.

In the following pages is described an apparatus which has been employed successfully at the Long Island Hospital for some time. It was devised by the author in the attempt to simplify and reduce the non-essential activity that accompanies the administration of arsphenamine in a large syphilitic clinic. As the photographs will indicate, the apparatus is constructed with the utmost simplicity, yet it reduces to the mere opening and closing of a few valves the injection of 25 or more doses of accurately measured arsphenamine and salt solution at the same time. It requires but one sterile and one non-sterile attendant to run the entire clinic. Any dosage from 0.03 gm. upward can be given. The physiological salt solution can be given before, simultaneously with, or after the arsphenamine. Any degree of pressure from 0 to 150 m.m. of mercury can be obtained. The apparatus is practically automatic and having once been set up, it will deliver 25 or more doses without further attention.

The apparatus is constructed upon the hydrostatic principles involved in the self-filling burette of the chemical laboratory. It consists of a sturdy upright rod which is supported by a heavy base. A sliding sleeve or carriage is nicely fitted to the upright and is adjustable to any height. This carriage in turn supports two smaller uprights (see photographs) which hold the reservoirs and measuring burettes. The reservoirs—glass flasks—are securely held by adjustable wooden clamps, the jaws of which are protected by a two-inch thickness of soft felt to prevent the crushing of the glass. The burettes are firmly held by metal clasps which fasten around their flanges. The burettes which we have used are 300 c.c. in capacity, graduated to 5 c.c.

The weight of the sliding carriage and its uprights, together with the loaded reservoirs, is

nicely counterbalanced by an iron dead-weight which slides on a smaller rod and which is connected to the carriage by a light steel cable that turns over a wheel above. In addition, the carriage has a screw clamp which immobilizes it when the desired elevation or pressure has been attained.

The tube connections are readily seen in the accompanying diagram. A glass syphon tube is placed in the flask-reservoir and to this is attached a rubber tube which is connected to the burette by way of a hard rubber or glass T-tube. The stem of the T-tube is in turn connected by a second rubber tube to the delivery tube. A pinch-cock (No. 1 and 2) is placed between the syphon tube and the T-tube and completes the system which automatically refills the burettes when they are empty.

The arsphenamine system and the salt solution system are connected by a glass Y-tube and the main delivery tube is connected to the stem of this Y-tube. A pinch-cock (No. 3 and 4) is placed between the burette and the Y-tube and this controls the outflow from the burette. Referring to the diagram, then, pinch-cock 1 controls the re-filling of the measuring burette from the salt solution reservoir, while pinch-cock 3 controls the amount of salt solution which is delivered to the patient. On the other side of the apparatus, pinch-cock 2 controls the re-filling of the arsphenamine burette, and pinch-cock 4 controls the dose that is to be given. At the end of the delivery tube is inserted a metal adapter which slips easily into the usual Schreiber 18-gauge needle with thumb guard.

A word about the delivery tube holder will not be amiss here for we believe that this has supplied a long-felt need, regardless of the apparatus used. One of the most annoying incidents which the operator meets with in the administration of arsphenamine is the constant shifting and the exasperating entanglements of the delivery tubes. In the activity associated with the coming and going of patients, with their adjustment upon the table, and with their preparation, the delivery tubes are often apt to become hopelessly entangled or to drop upon the floor. The operator sometimes makes futile attempts to hold them with impromptu weights or clamps them to the table cover. The following little instrument takes care of the situation without difficulty. It consists of a heavy metal base which supports an ordinary nickel-plated

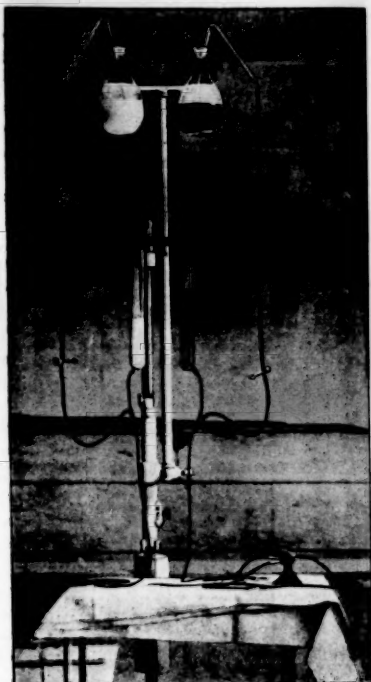


FIG. 1.—Arsphenamin apparatus.

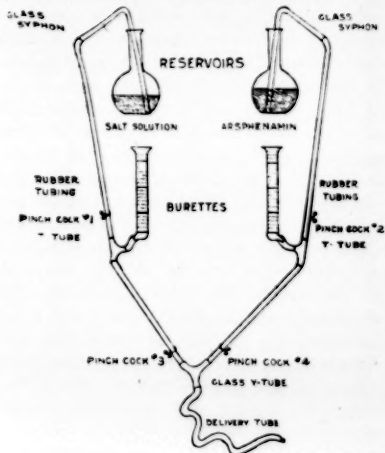


DIAGRAM ARSPHENAMIN APPARATUS

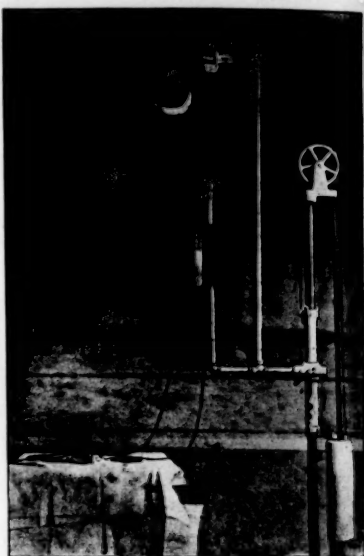


FIG. 2.—Arsphenamin apparatus.

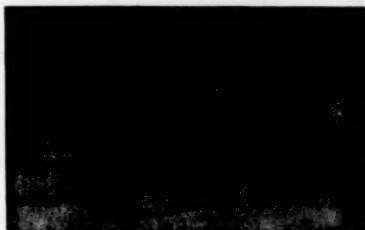


FIG. 3.—Delivery tube holder.

pipe clamp (see photograph). A one-hole rubber stopper is fastened in the clamp and the stem of the glass Y-tube is inserted into the hole. When connected to the remainder of the apparatus it has the advantage of staying where it is put and of holding the delivery tubes immobile. The glass Y-tube is invaluable because it acts as a three-way window—it allows the operator to see which solution is passing through the main delivery tube at any time. The rubber stopper becomes a shock absorber for the glass Y-tube and allows greater freedom in the manipulation of the delivery pinch-cocks.

The apparatus is used in the following way: The flasks, burettes, syphons, pinch-cocks, rubber tubing and delivery tube holder are made

sterile by boiling. A sterile attendant covers a small table with a sterile sheet and then assembles the rubber tube connections with the syphons, burettes, and delivery tubes. The syphons are then placed in the flask-reservoirs containing respectively salt solution and arsphenamine; sterile gauze is packed into the neck of the flasks to prevent the ingress of dust or flying substances in the air. The flasks are then given to the non-sterile attendant who fastens them in the wooden clamps.

The tops of the burettes are likewise covered with sterile gauze and placed in the burette holders. All connections having been made firm and the pinch-cocks in place, the sliding carriage is raised until the proper pressure has been reached. The syphons are then started in either of two ways: (1) with pinch-cocks 1 and 3 or 2 and 4 open and the burette connection to the T-tube held closed, a sterile glass pump is applied to the main delivery tube and the solution from the reservoirs is aspirated over; as soon as the solution reaches the level of the bottom of the flask it will run itself. Remove the pump, close pinch-cocks 3 and 4 and open burette connecting tube. The burettes will then fill; when the top mark is reached shut pinch-cocks 1 or 3. Opening cocks 3 or 4 will allow the solution to run from the delivery tube. This should be done to free the system of air bubbles. (2) This method is somewhat more complicated but does not require extra apparatus like the pump, which must be made sterile. Just before the reservoir-flasks are put in place, the burettes are half-filled with their respective solutions. With pinch-cocks 1 and 3 or 2 and 4 open, the solution is allowed to run from the delivery tube to expel the air. Then the burette connecting tube is clamped. The solution running from the delivery tube causes a partial vacuum in the system and finally sucks over the syphon. When this occurs, pinch-cock 3 or 4 is closed, the burette connecting tube is opened and the burette is allowed to fill until the top mark is reached. The apparatus is now ready for use.

We have found the following routine procedure to be the simplest and most satisfactory. The patient is placed upon a hospital transfer-wagon, the arm bared, and the cubital space made sterile with tincture of iodine. He is then wheeled to the administering table and a sterile towel is thrown over his hand and fore-

arm. A tourniquet is applied and a Schreiber needle is inserted into the vein. If the needle is freely in the vein, the level of the salt solution burette will be seen to fall evenly after pinch-cock 3 is opened. If this occurs, pinch-cock 4 is opened and the level of the arsphenamine solution having been noted, the drug is allowed to run until the required dose is given. Cock 4 is then closed; the salt solution is allowed to run for a moment longer, and when cock 3 is closed, the needle is withdrawn from the vein and separated from the adapter. The operation is thus concluded. A fresh sterile needle is used for each patient and the operator remains sterile throughout. He should wash his hands in 1:2000 corrosive solution after each injection.

The entire procedure is thus reduced to the opening and closing of pinch-cocks 3 and 4. It should take from 10 to 12 minutes to inject 120 to 200 c.c. of solution. McCoy,\* of the Public Health Service, has called attention to the danger of injecting the solution faster than this. Under these conditions, then, the apparatus will deliver about five doses per hour or 20 to 25 doses per clinic morning.

For very large clinics, caring for more than 30 patients, a double battery of burettes can be used and two patients can be injected at one time. The burettes are fed from the reservoirs by connections to the same syphon. Theoretically, the principle can be expanded to a five-battery system, injecting five patients at once and delivering 125 doses per clinic morning. It is doubtful, however, whether there are clinics which attempt to treat over 50 patients per morning, and hence the single or double battery-burette system will cover the needs of most clinics.

In the foregoing pages we have attempted to record the results of our investigations at the syphilitic clinic of the Long Island Hospital. They are written with the hope that they may aid in the development of a successful rationale of therapy which will eventually control that most dreadful of our preventable diseases—syphilis.

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## TORSION OF THE OMENTUM.

By EDW. H. RISLEY, M.D., F.A.C.S., BOSTON.

It is desired to report this case because it illustrates one of the factors to be considered in making a diagnosis of the acute abdomen and because it seems likely that etiologic factors not previously mentioned in the literature were present in this case.

Mr. J. D., age, 38, seen in the male medical o.p.d. of the Massachusetts General Hospital in consultation with Dr. Guy Mead, on September 14, 1918, at 10 a.m.

P. H. Unimportant; had never had any acute illness or fever except malaria many years ago.

P. I. For past two weeks has had a severe hacking cough with no fever and very little sputum. Cough has been paroxysmal and violent. For past 24 hours has had nausea but no vomiting, and slight pain midway between the appendix and gall-bladder, radiating across the abdomen to the left. The bowels have moved without medicine and there has been no fever. There is no history of violent muscular exertion or heavy lifting.

P. E. shows a large framed, muscular, robust laborer who lies quietly on the table evidently without pain, but who is frequently seized with violent fits of coughing. Throat, negative; larynx not examined; lungs, many coarse râles scattered throughout both sides; no dullness or change in respiratory note; heart, negative; temperature 98.8; pulse, 80; abdomen, not distended, soft, no muscular rigidity, no masses, but very slight tenderness on deep pressure directly above McBurney's point; rectal examination, negative.

Sent to medical wards for observation. Diagnosis: Acute diffuse bronchitis; question of appendix.

At 7 P.M. Temperature: 99.2. White count had risen from 9000 at 4 P.M. to 14,000; slightly increased tenderness in R.L.Q. and tender high by rectum. Seen in consultation with Dr. F. T. Lord, who stated that nothing but a diffuse bronchitis could be demonstrated in the lungs. Exploratory laparotomy under local anesthesia advised.

8.30 P.M. Operation. E.H.R. Novocaine anesthesia; peritoneum opened, no free fluid, appendix normal in size, color, and contour; absence of omentum in this region noted. During further exploration of the abdomen the finger came in contact with the tip of a lemon sized mass in the region of the gallbladder.

As it was thought likely that a condition not easy to be handled under local anesthesia was to be dealt with, the original incision was closed in the usual manner and the patient given oxygen and a high right rectus incision made. On opening the abdomen here again absence of the omentum was noticed but a distinct odor of gangrene was detected. On introducing the hand into the abdomen, a firm, rounded, irregular, movable mass the size of a lemon was grasped in the hand and pulled out of the incision. The mass proved to be composed entirely of omentum which, from two complete twists at the right free edge, was rolled up into the form of a sphere, was red, injected, hard, and on section had a necrotic centre.

This was tied off and removed. No other pathology was found. The remaining portion of the omentum was perfectly normal in every respect; there was no sign of any peritoneal irritation anywhere. The abdomen was closed without drainage.

The patient made an absolutely uneventful

recovery, his bronchitis quieted down and he left the hospital on the 12th day apparently perfectly well. When seen three months later he was free from symptoms, was working hard and had no weakness of his abdominal muscles.

Torsion of the omentum *per se* is a rare condition; only 131 cases having been reported in the literature prior to 1914. It most commonly occurs in the presence of herniae, some inflammatory condition in an adjacent organ, or following violent peristalsis, accompanying some intestinal disturbance.

It has also been found after sudden severe muscular strain and once in pregnancy, its occurrence in the latter condition probably being due to an old inflammatory condition in the pelvis to which the free edge of the omentum was adherent.

It is extremely rare in absence of some distinct intraabdominal exciting cause, which is generally mechanical (complicating hernia) or more commonly inflammatory.

Various theories as to the mechanism are advanced, among which the following seem the most plausible.

1. Torsion occurs as the result of adhesion to some adjacent inflammatory condition.

2. The twist may be due to the fact that the overdistended veins of the omentum wrap themselves, and incidentally the omentum itself, around the stiffer and shorter arteries. This dilatation of the veins may occur as the result of any transient or permanent intraabdominal or possibly extraabdominal congestion.

3. The omentum may be made to flow or roll by the peristaltic movement of the intestines or by the unequal pressure within the abdomen, along the line of least resistance; the omentum being compared to a handkerchief, folded triangularly, which is fastened at two corners, allowing the third to rotate.

The torsion may involve the whole omentum or only a small portion of its free (or attached) edge.

In the above case none of the etiologic factors mentioned were discoverable. A microscopic section of the matted ball of partly gangrenous omentum was not made, but from the history and physical findings it seems likely that one of two probable factors was present as the exciting cause in this case, neither of which has been mentioned before in the literature.

4. The torsion was caused by the rather

prolonged and violent cough from which the patient had suffered for two weeks; the act of coughing producing violent agitative motions of the diaphragm and adjacent abdominal organs caused a change of pressure and hence the twist; or

- B. A small infarct may have occurred in the lung as is not uncommon in such cases of bronchitis and which is not to be detected by the stethoscope—and from which a small embolus had been detached and carried to the vessels of the great omentum. Because of the matting no definite outline of the involved blood supply could be made out in this case.

The two above theories are offered as possible etiologic factors in the production of torsion of the omentum in absence of other demonstrable cause.

Careful analysis of cases reported shows that there is no symptom or symptom complex which is typical or even definitely suggestive of this condition.

Pain of varying degree is the most common symptom and is generally located in the right iliac region. Nausea is more liable to be present than vomiting. The bowels may or may not be affected. The temperature generally shows only slight elevation.

Physical examination generally reveals some form of indefinite tumor mass which may or may not be tender, depending on the length of time after torsion has occurred.

Purely abdominal torsion of the omentum probably cannot be diagnosed. The conditions which torsion simulates or which simulate torsion are most commonly: *tabes mesenterica*, *appendicitis*,—acute or chronic,—low grade obstruction of the bowels, abdominal abscess, tumors of the mesentery, *volvulus*, *mesenteric thrombosis* and *retroperitoneal new growths*.

Not all of these conditions call for immediate operation and, in consequence, torsion of the omentum may often fail to be diagnosed because of its insidious onset and lack of pronounced symptoms, its accompaniment of low temperature, pulse and respiration and the indefinite history of any exciting cause.

The presence, however, of a slight elevation of temperature, persistent nausea, more or less abdominal (constant) pain, and the detection of an indefinite abdominal mass which is moderately tender to palpation should, in the absence of other definite factors, make one suspicious of

a torsion of the omentum—especially if there is a history of previous hernia, an inflammatory process in the abdomen or any cause for violent disturbance of intraabdominal pressure.

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### SURGICAL TREATMENT TO PREVENT AND MINIMIZE PERMANENT DISABILITIES.\*

BY FRANCIS D. DONOGHUE, M.D., BOSTON,

Medical Adviser of Industrial Accident Board of Massachusetts.

A STUDY made by my friend, Carl Hookstadt, under the direction of the Department of Labor ("What Becomes of Men in Industry," *Monthly Labor Review*, July, 1918), emphasizes the fact that proper surgical treatment could prevent and minimize permanent disabilities, and is inseparably connected with adequate supervising authority and responsible direction of the injured man as a man.

Our thanks should be due to the Honorable William B. Wilson, Secretary of Labor, who, through Dr. Royal Meeker, has made possible this timely contribution to our knowledge and end results.

Compensation laws have now been in existence in this country for six or seven years and a large mass of experience must teach us many lessons if we have time to take stock. Six years of experience in the administration of workmen's compensation laws must be thoroughly convincing to everyone who has had to do with them that the best kind of medical treatment is the cheapest. This question cannot admit of argument.

Getting the treatment to the man or getting the man to the treatment is a thing over which the Industrial Accident Boards do not have sufficient control.

In my own State, the treatment is given under the direction of twenty-four insurance companies, each handling the case in its own particular way and the Accident Board acts only

when bad results have occurred or good results have not been obtained.

In general terms, the speed with which employees may be returned to work in surgical cases will depend upon the man and the system under which such cases are handled. Cases should not be sent to institutions which lack the methods of making proper diagnosis or the surgeons qualified to render the particular treatment, and the Accident Boards should have the power to regulate the institutions to which these cases are sent.

The system which obtains in Massachusetts of sending cases to the open ward of hospitals endowed or maintained for charitable purposes is not a good one and the treatment of industrial cases in hospital out-patient departments should not be permitted unless special arrangements are made so that a properly qualified surgeon shall actually carry out the treatment.

To refer to cases to show how men suffer from inadequate medical and hospital service would be to repeat in more or less detail all I have said since I became Medical Adviser of the Massachusetts Industrial Accident Board.

As the cases that come to our Board are the poor results, our viewpoint is apt to be distorted because we do not see the thousands of cases in which adequate service has been rendered, and injured employees properly restored economically.

Adequate surgical treatment to prevent and minimize permanent disabilities is the same kind of treatment which will minimize the loss resulting from the less serious forms of injuries. The permanent disabilities represented by the amputation of an arm or leg or by the loss of an eye, are evident, and occupy attention out of proportion to their relative value in industrial injuries.

Less intrusive upon the eye of a claim adjuster and making a less insistent appeal to the administrators of the compensation acts, are injuries to the hand.

Rather than discuss in abstract terms, as I think I have before, the whole surgical field, I am going to take up briefly one group of cases and endeavor to focus your attention upon injuries to the hand. The hand is such an important factor in the earning capacity of an injured employee that we have given special attention to this type of case, endeavoring to educate insurers and others to the necessity of

\* Read at the 8th Annual Meeting of the International Association of Industrial Accident Boards and Commissions, on September 26, 1918, at Madison, Wis.

specialized treatment with the object in view of restoring men to industry with the smallest economic loss. My interest has been stimulated by the successful work of Dr. William E. Browne of Boston, who has in some cases acted as an impartial examiner for the Industrial Accident Board.

Do we fully realize the value of the full capacity of the hand?

Injuries to the hand vary in their severity. These injuries vary in their severity from simple contractures to hands which are claw-like in appearance. The two great causes which result in these deformities are first, sepsis, and secondly, fractures. A great many cases of sepsis occur as the result of too many sutures placed too tightly in some small skin wound. These cases are found most frequently in large relief stations where young, conscientious, but over-enthusiastic internes strive assiduously for a fine looking wound. It may seem strange, but nevertheless it is a fact, that out of every very large series of crippled hands a great percentage of them was attributed to faulty application of sutures. Nearly all the skin wounds with which one meets in industrial accidents may be attended to by careful application of perforated adhesive plaster with a sterile dressing, and most important, a splint. On the whole, these cases do better with dry dressings, probably because the sub-cuticular tissues are made better culture media as a result of long continued and frequent soaking in various solutions. It has been my experience that when it is possible, it is best to apply water running from a faucet, both hot and cold, and then squeeze out the water from the dressing and cover it with a Turkish towel.

A poorly set, a non-recognized, or a slipped fracture of a metacarpal bone will cause a greater period of disability than a poorly treated Colles' fracture. The average length of disability from an impacted fracture of the lower end of the radius is six to eight weeks. Why? Because the lower end of the radius is almost a fixed object, and an ordinary flannel bandage will serve at times to give a man a fairly good wrist. This is very well proved by the fact that many men treated with liniment and a flannel bandage for supposed sprain of the wrist get back to work in six to eight weeks' time although they really had Colles' fracture. On the other hand, the metacarpal bone is a long curved bone with about the same curve in it that

we find in the normal femur. On the flexor surface of this bone we find three tendons; on the dorsal surface one tendon, and to these groups of tendons the lumbrical muscles are attached, and lastly the interossei muscles are attached to the metacarpal bone, so that in the palm of the hand there is a complex anatomical situation with its basic principle, the metacarpal bone. If the metacarpal bone is improperly set, or not set at all, it throws out of normal working order seven muscles, and in turn these seven muscles cause the other muscles of the hand to remain quiet in order to avoid the pain, and at just this point with reference to fractures of the metacarpal bone is the starting point of many crippled hands, which require serious and skilled operative interference in order to prevent them becoming permanent disabilities. In the fingers themselves where compound fractures of the phalanges are found, or simple fractures in poor position, interference with the action of the flexor or extensor tendons may result, causing a long continued disability and not infrequently resulting in amputation. It has been my experience that removal through careful dissection of the smaller fragments of a fractured phalanx (when in poor non-working condition) gives the man a working hand much better than any other way. This removal of pieces of fractured phalanx must be done without any injury whatsoever to the synovial sheath of the flexor tendon.

There are many rules which one might lay down with reference to the treatment of fractures of the small bones of the hand. But in the treatment of these fractures the one greatest thing to bear in mind is that these bones serve as levers for the movement of tendons, and that interference with the plane of the bone will cause interference with the movement of the tendons. The greater the disturbance of the bone the greater the disturbance in the tendon; the greater the amount of pain in the hand, the longer the man's period of disability.

With reference to the soft tissues as a whole in the forearm and hand, it is difficult to say a great deal or to say anything which will mean very much to anybody. For example, if a man has pain in the index finger of his right hand, can that pain be due to abnormal position of structures in the little finger of the hand? If a man has flexor and extensor tendons, which in themselves are all right, why should he not have normal flexion and extension in the distal

phalanges of his fingers! This brings up the lumbrical muscles question. A man with a thumb and index and a little finger can do almost as much with such a hand as a man with all fingers present. When tendons have sloughed in the palm of the hand they may be very well replaced by fascia lata and get good results, but in order to get a good result it is necessary to make a quick and careful dissection of the parts into which the graft is to be placed, and if you place a graft in a finger in an anatomically correct position, making allowances for the movement of the finger, allowances for amount of contracture in the graft you put in, you will restore the greater percentage of crippled fingers.

Every man is *not* qualified to operate upon the hand. Surgeons of great experience in abdominal and chest operations or in the treatment of fractures are flat failures when it comes to doing plastic operations upon the hand. These cases are so important that they demand men who are fully qualified in the surgery of the hand itself.

The treatment of the hand is not an orthopedic proposition, in the sense that orthopedic surgeons alone should be allowed to treat it. It is a capital problem in major industrial surgery.

I would like to say one word here of the tendency of the orthopedist, who is really a mechanician, to invade the surgical field by means of operations. Orthopedic surgery is still in a state of transition and perhaps general surgery itself is in a period of transition, many general surgeons coming to know that they are incapable of carrying out long continued mechanical treatment; while, on the other hand, the surgical training of the orthopedic men is, as a rule, deficient and their surgical sense is of late development. They have not had experience in surgical clinics and have not been called upon to treat acute surgical emergencies, the results of which have afterwards drifted into their hands. It almost may be said that they lack general surgical diagnostic ability although extremely keen to sense mechanical conditions that a general surgeon constantly overlooks.

Orthopedic surgeons, as a rule, have drifted into surgery through the chronic channel, and we should utilize them only in such cases as they have proved their ability to handle them properly. The orthopedist has taught the general surgeon much by his perseverance and patience in the

non-spectacular problems of neglected surgical cases. Orthopedic surgery during the war has developed wonderfully. Its scope has been materially enlarged, and from its vast experience great good may be obtained for our industrial cripples.

Cases should be held under such control so that all instructions of the surgeon should be made effective and when the period of active treatment is over, if the employee does not at once return to work, there should be a follow-up system to persuade the employee to return.

Right here let me say that one of the greatest factors in prolonging disability is in preparing the mind of the injured workman for his first plunge back into industry.

After a severe injury, if the man goes back to work for one day in a week and is given his compensation for the full week without deduction, and the second week, two days or three days, finally, at the end of the third or fourth week he has re-acquired his self-confidence in his own capacity.

Serious injury undoubtedly shakes a man's confidence in his ability to do work until he again finds himself. The longer he is allowed to drift, the longer he remains unemployed; the longer he remains away from treatment that will restore him, the further he falls in the economic scale; and as he falls in the economic scale, his sense of uncompensated injury may become a fixed idea, so that in addition to the difficulty in remedying a mechanical condition, we have to do with a mental condition no less trying.

To most men advised to return to work, their conception of work is based on previous experiences, and employees should not be made to feel that they are being forced back to work before they are able. To find that a non-English speaking laborer whose only occupation has been the labor of the pick and shovel should return to light work and his compensation should be reduced is an absurdity. Something more is needed than turning the employee loose with the advice that he should find some light work. He has been working under the watchful eye of the boss and his idea of work is to keep up with his fellow workman and produce all that is required every day.

Under a proper system, working in conjunction with the physician, hospital, or educational influence, persuasion may be necessary, not only applied to the employee but to the employer, fol-



lowed down to the immediate superior of the employee; and above all, to the insurance adjuster, if he does not comprehend the problem and how it should be managed.

Industrial Accident Boards should be keen to help in the replacement work of the wounded of our great war. We should be alive to the opportunity that is afforded to develop industrial surgeons through the great opportunity of concentrated work.

The improved methods developed for the treatment, cure, and rehabilitation of the crippled in the army of warfare should be made available for the improved handling of the injured or disabled in the army of industry.

Hand in hand with adequate medical and surgical diagnosis and treatment must go a firm, direct, and controlling administrative function.

### A CASE OF ASSOCIATED PAINS IN THE KNEE AND PENIS.

By HERMAN W. MARSHALL, M.D., BOSTON.

A man of medium height, weight, and average muscular development, who is in fairly good health and slightly past middle age, noticed a disturbance of sensation come on gradually without apparent cause in the area of distribution of internal pudic nerve filaments upon the dorsum of the penis. There has been pain at times also upon the inner side of the left knee, usually sharply localized as a small spot, but encircling the patella when at its worst.

When the penile pain is most pronounced the knee also is most painful usually, and the character of the symptoms in both places has been a burning feeling increasing to a stinging ache.

For two years the patient has suffered without securing relief from services of eight doctors whom he has consulted.

A genito-urinary specialist examined the bladder cystoscopically and found no abnormality. The urethra was dilated with sounds without effect. X-rays of the pelvis were negative, and finally the seminal vesicles were removed on account of obstructed orifices. There was relief from the pains while he remained in bed after the operation; but on resuming activity the symptoms returned.

He has been seen by a well known neurological

specialist in Boston who did not believe that there was a definite neuritis of the internal nerve, and who referred the patient to the writer for an opinion regarding the possibility of some obscure orthopedic defect being the cause of the pains.

Physical examination of the patient was negative for objective signs, as it was first made by the writer. X-rays previously taken were negative, and adhesive strappings applied around the pelvis in a manner to reinforce pelvic ligaments had no effect on the symptoms. There was no discoverable abnormality of the knee.

A possible diagnosis therefore had to be thought of wholly from history of the case and from the subjective symptoms.

In reviewing the history, it should be mentioned that the patient has been able to continue his work as interior decorator, but at times has broken down nervously. He is very miserable at times and then he has partial cessation of the pains for a while.

He has found that walking, stooping, and moving around will sometimes relieve him, also he discovered that the pain ceased after sitting fifteen or twenty minutes in the chairs at a moving picture theatre which he frequently went to. While taking a bath there is also often cessation of the symptoms, and when lying abed he is usually free of pain.

The writer was unable to make the data mentioned fit any set of symptoms known to accompany muscular or ligamentous strain, bone or joint infections, or osseous new growths. Yet the problem seemed such a definite anatomical one that finally the possibility of an obturator hernia was thought of; and at the next visit of the patient he was re-examined.

While he lay on his back with thigh semi-flexed and abducted, pressure was made with the finger over the left obturator foramen behind the insertions of the adductor muscles of the thigh. Definite localized tenderness was discovered, and he remarked that he never knew before that he had this sore spot. Outwardly there was no bulging nor appreciable changes in adductor muscles.

Pressure of the finger over the left sacro-sciatic opening of the pelvis elicited a feeling of weakness when the pressure was made hard enough, but no sensation of abnormal soreness as at the obturator foramen.

Further inquiry brought out the fact that the

penile pain was worse on the left side, which is significant in view of the pain in the left knee. Penile symptoms were referred, however, to the entire tip on both sides extending back a distance of one and a half inches.

A truss constructed of appropriate sized felt buttons which were attached to a strap of several layers of adhesive tape was put on the patient so that obturator and sacro-sciatic foramina were pressed upon. The result was found to be simply that the sciatic pad was uncomfortable to sit on, and the obturator button did not relieve the symptoms although at first it was imagined that it did. This contrivance, therefore was abandoned.

#### INTERPRETATION OF THE CASE.

Internal pudic nerves pass out of the pelvis through the great sacro-sciatic foramina but pass in again almost immediately through the lesser sacro-sciatic foramina after passing the ischial spines. Then, roughly speaking, they follow the pelvic arches of bone up along ischial rami and pubic rami around inner margins of obturator foramina in company with internal pudic arteries to reach their destination in penile structures. Each internal pudic nerve is enclosed in a sheath of obturator fascia in a part of its course.

Obturator nerves pass into the thighs from the pelvis through obturator foramina in the upper parts of these foramina, and supply abductor muscles, hip and knee joints, and at times furnish branches to integument of thighs and legs.

A hernial bulging of the obturator fascia, if of appropriate size, would conceivably cause a pulling on internal pudic and obturator nerve filaments and give rise to pains such as this patient has suffered.

In view of the tenderness localized over the left obturator foramen, and on account of the variability in the symptoms, a diagnosis has been made of a reducible obturator hernia which pulls or presses at times on the obturator and internal pudic nerves of the left side. Relief is obtained when it does not descend into the hernial sac.

Treatment of this hernia is rather uncertain in its results, and the patient is unwilling to have any more operations now while he is able to work regularly without crippling discomfort. The dangers of strangulation have been made known to him, and he promises to

report immediately to a surgeon if he is unable to relieve the pains by reducing the hernia by the procedures he has learned.

The knee symptoms of this patient scarcely place it in the class of orthopedic cases, but, because it has many sides, perhaps the circumstance that it is reported by an orthopedic surgeon will be overlooked on account of its general interest.

#### GASEOUS EXCHANGE WITH UNPRACTICED SUBJECTS AND TWO RESPIRATORY APPARATUS EMPLOYING THREE BREATHING APPLIANCES.

BY M. F. HENDRY, T. M. CARPENTER, AND L. E. EMMES, BOSTON.

[From the Nutrition Laboratory of the Carnegie Institution of Washington, Boston, Mass.]

(Concluded from page 344.)

#### CAN RELIABLE RESULTS BE OBTAINED WITH UNTRAINED SUBJECTS?

One of the specific objects of this series of experiments on the respiratory exchange of man was to determine whether untrained subjects would give reliable results, how many periods might be necessary, and what the possibilities are of the clinical application of methods for determining the respiratory exchange of patients when there is no time for training, and also when there is very little possibility of repetition of the series on a succeeding day. Even a superficial acquaintance with hospital records shows that the opportunities for extended series of observations with no actual change in the condition of the patient, or with sufficient time and assistance to carry them out, are extraordinarily limited. The clinician desires to obtain indexes for diagnosis in the shortest time practicable, the patient desires an alleviation or cure of his condition as soon as possible, and furthermore, the course of the disease may be so rapid that a duplication of condition cannot be expected. Consequently, whatever methods are used in diagnosis, the clinician desires and must have those that admit of no practice effect. We hope that this series of studies will contribute in some measure toward a solution of the question as to whether measurements of the respiratory exchange are reliable when carried out with untrained subjects on only one day.

We have already tried to show that these subjects were as untrained as any patients in a hospital. In fact, in some hospitals the patient is brought to the metabolism room one or more days before the actual measurements are made and the apparatus is explained to him. Not even this was done in the present research. Many of the subjects had not the faintest conception of the experience before them. What happened was that the first subjects told their fellow students about the experiments but the probable effect was to increase any latent apprehension or reluctance rather than to decrease it. No previous information of this kind, however, would contribute in any way to the technical training of the subjects. We feel that in this company of 17 young men we have a typical group of untrained subjects. That we succeeded as well as we did is due, we feel, to the excellent coöperation of the subjects, the smoothness of the routine, and lastly, of more importance here, to the fact that training is not required for securing reliable results. In other words, as a result of all of our evidence and experience, it is our belief that training is not necessary for obtaining results which can be depended upon as a measure of the actual metabolic level of the individual at the time he is measured. We offer as evidence of this the fact that the figures for the oxygen consumption, with the possible exception of those for the first period, show, on the average, that there is really no practice effect as such. The pulse rates confirm this in a measure, if we consider this factor both as an index of apprehension, and of a change in metabolic level during the twelve measurements of the morning. The pulse rates also show that frequently, when high values are secured, they are characteristic of the subject and not due to experimental conditions. We believe that both the pulse rate and the oxygen absorption give evidence that continued experimenting after a certain time tends to cause both of these to rise. Consequently, we recommend that in determining the basal metabolism with a breathing appliance apparatus, the observations should be continued for at least three periods, but no more. That is, there should be one period in which the technique is carried out to demonstrate to the untrained subject that there is nothing objectionable or painful about the observations, and to make sure that all

of the operations are understood, with two additional periods for measurements which are to be considered reliable.

We must repeat here what has frequently been stated in other publications from this laboratory, that a preliminary period of one-half hour of quiet is necessary to eliminate the effect of previous activity, to accustom the patient to his surroundings, and to secure a true basal level. In some cases there may be a delay in reaching this basal level because of the apprehension of the subject which cannot be overcome until the first period has been carried out. There were several instances of this in the present research. The records of the pulse rate are of great assistance in determining the presence of apprehension, the rapidity with which the subject becomes used to the apparatus, and the final general level of his condition. We strongly recommend frequent records of the pulse-rate during the entire stay of the subject in the experimental laboratory.

Our conclusion is, therefore, that reliable results in the measurement of the respiratory exchange can be obtained in the majority of cases with wholly untrained adults, and that after the first measurement practice plays a relatively small rôle.

#### RECOMMENDATIONS FOR PROCEDURES IN THE MEASUREMENTS OF RESPIRATORY EXCHANGE IN SHORT PERIODS WITH UNTRAINED SUBJECTS.

Suggestions for measurements of this character have been given in a monograph from this laboratory, and to some extent recommendations here given are a repetition of those already published.<sup>21</sup>

For the determination of the oxygen consumption alone of an individual in the post-absorptive state at rest, we recommend the use of the Benedict portable respiration apparatus, the rubber mouthpiece and noseclip, together with the Emmes method of control.

If the respiratory quotient and carbon-dioxide elimination are desired in addition, and there is time and assistance at hand to carry out the gas analysis, we recommend the use of a well-counterpoised spirometer, mask,\* or pneumatic nosepieces (Benedict form), and the portable form of the Haldane gas analysis apparatus. In this connection we recommend and

\* None of our subjects had beards, so that an exception might have to be made in such cases.

insist upon an adequate control of the accuracy of gas analyses made by the Haldane apparatus, such as is furnished by frequent analyses of outdoor air. A summary of such controls should be given by investigators using the apparatus.

We advise the use of accessory control apparatus in all measurements of respiratory exchange of any character. We especially recommend the taking of the pulse rate as frequently as possible (preferably at least every five minutes) from the time the patient arrives in the laboratory until he leaves it; the graphic record of the respiration rate by means of a pneumograph around the chest or thorax; the graphic record of the presence or absence of external and visible activity during the experimental periods obtained from a pneumograph placed around the upper thighs; a graphic indication that the subject has been sufficiently awake to respond to a signal heard by him, *viz.*, a record made by means of a push button operated by the subject in response to an auricular stimulus frequently given.

We recommend that the subject remain in the bodily position he is to maintain during the measurements for at least one-half hour before the first measurement is begun (a recommendation repeatedly made in publications from this laboratory), and that both pulse rate and respiration rate be obtained during this time.

We recommend three periods of measurement of the respiratory exchange, whatever apparatus is used. The first period should be for practice, to make the subject acquainted with the procedure, and to allay his apprehension. When time is limited and the condition of the patient does not warrant a long enough stay for the regular procedure, the first observation period might be during the first half hour. The two additional periods should be made under the most careful conditions and only these two should be used as a basis of calculation or interpretation.

When the basal metabolism only is desired, it is an economic waste to attempt any other measurement than that of the oxygen absorption supplemented by the controls we have recommended. But when information is desired as to the metabolic effect of food or drugs upon an individual, the respiratory-valve apparatus and its accessories, adequate assistance

for the routine work, and a trained and reliable subject are the only conditions which can satisfy all the requirements of dependable scientific research.

#### SUMMARY AND CONCLUSIONS.

The respiratory exchange of 17 untrained medical students was measured with each of three breathing appliances, namely, mouthpiece, nosepieces, and mask, on two different respiration apparatus, the Benedict portable apparatus and a respiratory-valve apparatus. Each measurement with each subject was made in duplicate. To avoid influence of apparatus, six different orders of periods, so far as apparatus was concerned, were employed.

The results show that there are no marked differences in the respiratory exchange when the breathing appliance alone is considered. The breathing is slightly more normal with the mask.

The oxygen consumption is practically the same regardless of the breathing appliance or respiration apparatus used. The general trend of the oxygen consumption for the twelve periods, considered from the standpoint of time, indicates that there is practically no difference from period to period between 8.30 A.M. and 12.30 P.M. The general tendency for the metabolism to remain stationary is confirmed by the course of the pulse rate.

There is a slight tendency for the carbon-dioxide elimination to be higher with the portable respiration apparatus than with the respiratory-valve apparatus. This is due primarily to a tendency to a slightly greater ventilation of the lungs.

The average respiratory quotient with the portable apparatus is slightly higher than that with the respiratory-valve apparatus, and the lowest with the mask as compared with the mouthpiece and nosepieces. The general level of the respiratory quotient throughout twelve periods of measurement from 8.30 A.M. to 12.30 P.M. remains practically constant.

There is no indication that practice has any tendency to alter the course of the total metabolism as shown by the measurements of twelve successive periods on one day, and the results, in general, indicate that they are quite normal and can be considered as reliable.

When the measurement of the oxygen consumption alone is desired, the Bene-

diet portable respiration apparatus is the best apparatus for short-period measurement. When more data are desired, such as total ventilation, respiratory quotient, and mechanics of breathing, the respiratory-valve apparatus is better. For continued experimenting from period to period without interruption, the mask is preferable to the other two breathing appliances.

The average per minute values obtained with these 17 medical students in the post-absorptive state, at rest, and varying in age from 21 to 25 years, in weight from 51.1 to 76.1 kilograms, and in height from 161 to 190 centimeters, may be summarized as follows:

Carbon-dioxide elimination, 196 c.c.

Carbon-dioxide elimination per kilogram per minute, 3.12 c.c.

Oxygen absorption, 236 c.c.

Oxygen absorption per kilogram per minute, 3.76 c.c.

Respiratory quotient, 0.84.

Pulse rate, 64.

Respiration rate, 14.4.

Volume of lung ventilation, 5.87 liters.

Volume per respiration, 510 c.c.

Percentage of carbon dioxide in expired air, 3.45 per cent.

Percentage of oxygen deficit in expired air, 4.13 per cent.

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### Book Reviews.

*The Stereoscope in Ophthalmology, with Especial Reference to the Treatment of Hetero-*

*phoria and Heterotropia.* By DAVID WELLS, M.D., F.A.C.S., Professor of Ophthalmology, Boston University Medical School, Surgeon, Massachusetts Homeopathic Hospital. Globe Optical Co. 1918.

This is the second edition of this work and though having only 143 pages, is full of valuable information. After a discussion of binocular vision, the author gives his own methods of examining and treating muscular imbalance. Stereoscopic fusion training is described in detail and also a practical application of the phoro-optometer stereoscope with the author's charts. Other forms of treatment found useful are also given, as well as an account of the operative technic. The last chapter shows how scotomata may be mapped out in eyes lacking central fixation by Haitz's stereoscopic method or the phoro-optometer used with the Haitz-Bissell or Lloyd charts. Also Bissell's method of measuring the blind spot is given. The book is succinct and useful.

*The Diagnostics and Treatment of Tropical Diseases.* By E. R. STITT, A.B., Ph.G., M.D., LL.D. Third Edition. Revised. Philadelphia: P. Blakiston's Son & Company. 1919.

As this work dealing with "The Diagnostics and Treatment of Tropical Diseases" was thoroughly revised in the second edition, which was published less than a year ago, this third edition has not been changed to any great extent. The most important addition to this volume is the new material which has been added to the subject of trench fever, in the knowledge of which considerable progress has been made during the past year. Two new illustrations and a plate of malarial parasites have been added, and some changes have been made in various sections.

The book is divided into two parts, the first discussing individual tropical diseases, with especial emphasis on epidemiology and prophylaxis. Tropical diseases are classified as those due to protozoa, to bacteria, to filterable viruses, and infectious granulomata, skin diseases, and food deficiency diseases. One chapter includes a discussion of certain diseases of disputed nature of minor importance which cannot be classified readily in any particular group. Part two deals with the diagnosis of tropical diseases, and differentiates diseases by grouping them according to clinical manifestations rather than by treating them separately as individual diseases. This book presents the subject of tropical diseases in complete, compact, and accessible form.



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## VITAL STATISTICS OF ENGLAND AND WALES, 1901-1910.

ATTENTION has been called in previous issues of the JOURNAL to the present declining birth-rate in Great Britain. In comparing the present situation with previous years, the vital statistics of England and Wales for the years 1901-1910, which have been published in *The British Medical Journal*, are of interest.

The report of the Registrar General shows that the marriage rate per 1,000 single and widowed males, aged 15 years and upwards, which was 60.9 in 1861-70, fell to 53.6 in 1891-1900, and fell further to 51.6 in 1901-10. The crude birth rate, which was at its highest point in the decennium 1871-80—namely 35.4 per 1,000—had fallen to 29.9 in 1891-1900 and reached 27.2 in 1901-10. The legitimate birth rate per 1,000 married women, aged 15 to 45, declined rather faster than the crude birth rate and was, in 1901-10, 75 per cent. of the maximum value.

There is now little difference between the standardized birth rates of urban and rural counties. The difference between the contrasting groups, which stood at 2.46 per 1,000 in 1881-90, was 1.77 in 1891-1900 and only 0.57 in 1901-10. During more recent years, the rate of decline except in the Home Counties has been generally greater than before. The standardized death rate of 1901-10 was 16.6 per 1,000 for males and 13.9 for females, respectively 73.8 per cent. and 67.1 per cent. of the corresponding rates for 1841-50; the decline has been both relatively and absolutely much greater in the last decennium than during any previous period. Thus the male rate in 1881-90 was 20.0 and only declined to 19.5 in 1891-1900; the fall in the past decennium was nearly equal to the difference between the rates for 1891-1900 and for 1861-70. The improvement has been greater in women than in men. As a rule, the mortality rates have been lower in counties in which the greatest proportion of the inhabitants were in rural areas.

Between the years 1901-10, infant and child mortality has declined greatly. In 1841-50, the deaths under one year per 1,000 births were 153, and the same rate obtained in 1891-1900; in 1901-10, the proportion was 128. The mortality under age 5 per 1,000 living was 66 in 1841-50, 57.7 in 1891-1900, 46.0 in 1901-10. The remarkable fall commenced in 1902. Diarrheal diseases, tubercle, convulsions, and bronchitis are the causes of chief numerical importance in the mortality from which substantial reductions have occurred.

The death rates from all forms of tuberculosis and from phthisis declined 18.6 per cent. and 19.4 per cent. between 1891-1900 and 1901-10. In the fifty years from 1851-60, tuberculosis mortality has been nearly halved in males and more than halved in females. In the decennium 1901 to 1910, 304,141 deaths were ascribed to cancer or malignant disease, giving a standardized death rate of 867 per million, 13 per cent. higher than in the previous decennium. This and diabetes (the death rate from which increased from 77 to 93 per million) are among the few causes of death which show a rapidly increasing mortality. The rate of natural increase of the population in 1901-10 was very slightly higher than in 1891-1900 (11.8 per 100 against 11.7) and nearly as great as in 1851-60 (11.9), the declining birth rate having been compensated by the fall in the death rate. Dur-

ing the last few years, however, this has not been true, for the declining birth rate, even before the war, had become so marked that it was not compensated by the lessening death rate.

#### WAR ACTIVITIES OF THE UNITED STATES PUBLIC HEALTH SERVICE.

THE United States Public Health Service greatly assisted the prosecution of the war by carrying out war activities in several fields. The Public Health Report for June 6, outlining the work accomplished by this department, states that the first effort made was the formulation of a program, in February, 1917, which included the sanitation of ports and places within the United States in order to prepare them for camps of mobilization, concentration, or training for the Army or Navy, the sanitary supervision of mobilized industrial forces, medical and surgical relief to sick, wounded, or disabled soldiers and sailors at relief stations of the service, medical and surgical relief to mobilized industrial workers, laboratory operations, including both research and manufacture of serums and vaccines, and activity in the field of industrial hygiene.

In order to carry out these plans, there was established by Congress a reserve of medical officers, sanitarians, engineers, and other qualified experts in the Public Health Service. On June 30, 1917, the service consisted of 538 professional personnel, 1,506 other personnel, a total of 2,044. One year later, the professional personnel amounted to 1,472, and the total to 4,987.

In July, 1918, an order was passed bringing all Federal civil health functions under the supervision and control of the Public Health Service in order to secure more effective coördination. One of the first steps taken by the Service was the sanitation of extra-cantonment zones. A system of federal health supervision was established in and about zones surrounding military camps and important industrial centers engaged in war work. This work was greatly facilitated by the coöperation of the American Red Cross, and state and local health authorities. In some rural areas, the work consisted largely of measures designed to control the spread of malaria; in others, efforts to pro-

tect drinking water and insure a safe milk supply; in the cities, questions of sanitary housing, of the control of communicable diseases, and of industrial hygiene presented the chief problems. Men were vaccinated for smallpox and were encouraged to take the typhoid inoculation; barracks and bungalows were built; and medical and surgical relief stations were constructed in connection with industrial plants. Scientific research was carried on in the investigation of industrial fatigue, trinitrotoluol poisoning, the nutritive value of various kinds of flour and bread, dermatitis from mercury fulminate and parazol, antitoxin against gas gangrene, the administration of arsenamine, and other problems.

The increase in the production and use of serums, toxins, and analogous products involved an increased amount of work for the Hygiene Laboratory in the supervision of biological products. During the period of the war, 1,102,812 cc. of bacterial vaccine were distributed.

In discharging its duties in controlling and preventing the spread of communicable diseases, the Public Health Service realized its responsibility in organizing an effective campaign for the control of venereal diseases, and accordingly provided for the appointment of an officer in each state to direct the work of venereal disease control. During 1918, 22,441 cases of venereal diseases were treated in the extra-cantonment clinics.

In order to provide adequate medical and surgical relief, an order was issued by the President making all marine hospitals of the Public Health Service available for the treatment of the enlisted personnel and officers of the Army and Navy whenever such treatment was requested by the proper military authorities. Altogether, for the fiscal year ending June 30, 1918, there were treated at the United States marine hospitals and relief stations over 5,000 officers and enlisted men of the Army and Navy.

#### TETANUS IN BRITISH MILITARY HOSPITALS.

NINE analyses of cases of tetanus treated in British home military hospitals have been commented upon in previous issues of the JOURNAL. The tenth and eleventh analyses, which com-

plete the series, have been published in *The British Medical Journal*. The following table shows the number of cases of tetanus considered in the eleven analyses and the rates of mortality:

ANALYSES	NO. OF CASES	RECOVERED	DIED	MORTALITY PER CENT.
1 1914-15 .....	231	98	133	57.7
2 1915-1916 .....	195	99	96	49.2
3 Aug.-Oct., 1916 .....	200	127	73	36.5
4 Oct.-Dec., 1916 .....	100	69	31	31.0
5 Dec., 1916-Mar., 1917 .....	100	81	19	19.0
6 Mar.-June, 1917 .....	100	71	29	29.0
7 June-Sept., 1917 .....	100	85	15	15.0
8 Sept.-Dec., 1917 .....	100	84	16	16.0
9 Dec., 1917-April, 1918 .....	100	76	24	24.0
10 April-Sept., 1918 .....	100	74	26	26.0
11 Sept., 1918-Mar., 1919 .....	100	74	26	26.0

A diagram showing the ratio of the cases of tetanus to the number of wounded soldiers treated in home military hospitals from August, 1914, to March, 1919, shows an abrupt decrease in the ratio in November, 1914, probably due to the introduction of prophylactic injections of antitetanic serum. The fact that the incidence of the disease tended to become lower as the war went on may be explained by the fact that it became possible to administer earlier and more thorough surgical treatment. On the introduction of primary excision and primary or delayed primary suture, remarkable results were obtained. Complete and early excision of gunshot wounds was a potent factor in the prevention of tetanus. It is probable that in time, if the war had continued, tetanus would have been extinct as a war disease in the British Army.

The total number of cases of tetanus dealt with in these analyses was 1,426. The average incubation period in days for each of the eleven analyses in chronological order was 13.4, 31.2, 30.6, 45.0, 67.0, 44.1, 55.5, 46.9, 46.19, 68.5, and 54.8; the average incubation period for the whole series was 39.5 days.

In the tenth analysis there were 67 cases of general tetanus and 13 cases of local tetanus; the rate of mortality in the former was 29.9; among the latter there were no deaths. In the eleventh analysis there were 86 cases of general and 14 of local tetanus; the rate of mortality in the former was 30.2, and among the latter there were again no deaths.

In November, 1918, the primary prophylactic dose of antitetanic serum was increased from 500 to 1500 units. The value of the antitetanic serum has been undoubtedly established; but clinical and experimental evidence shows that immunity decreases within about

ten days. It was therefore decided that four prophylactic injections should be given to every wounded soldier at intervals of seven days. Figures are not yet available to show whether or not multiple inoculations result in the lowering of the incidence of tetanus among the wounded; but statistics indicate that the death-rate among those who contract tetanus tends to fall as the number of injections increases from one to five.

Interesting experiments were made in the administration of a double serum containing the antibodies of tetanus and gas gangrene; this was not successful in the prevention of gas gangrene, though the addition of antitoxins or other anaerobes seemed to have no effect, either good or bad, on the tetanus antitoxin.

In the administration of tetanus antitoxin, time is an important element. The opinion of the tetanus committee is that "in acute general tetanus the best method of treatment lies in the earliest possible administration of a large dose of antitoxin by the intrathecal route, repeated on the following day, combined with and followed on succeeding days by subcutaneous and intramuscular injections." In cases of acute general tetanus, large doses of serum produced the best results. *The British Medical Journal* observes that from analysis of the figures in the last two series of 100 cases treated in home military hospitals no case can apparently be made out either for or against the intrathecal route. In each of these two series one patient did not receive therapeutic treatment with antitetanic serum, and died. Of the 99 patients in each series who received this treatment, 74 recovered, and 25 died.

#### MASSACHUSETTS STATE DEPARTMENT OF HEALTH.

MASSACHUSETTS was the first state in the Union to organize a State Department of Health. In 1849, an investigation was carried on by a legislative committee, which resulted, after a period of twenty years, in the creation of this organization. The fiftieth anniversary of the establishment of this department was observed at the State House on September 15 and was attended by many members of the profession who have been most active in public health work

in all parts of the country. Eugene R. Kelley, Commissioner of Health, presided over the meeting, and visitors were welcomed on behalf of the State by Governor Coolidge. Among the speakers were Dr. Henry P. Walcott, the commissioner of the department between 1886 and 1914; Dr. William H. Welch, director of the School for Public Health of Johns Hopkins University; Dr. A. J. McLaughlin, former State Health Commissioner and now assistant surgeon general in the United States Public Health Service; and Sir Arthur Newsholme, formerly chief medical officer of the local government board of England.

Some of the noteworthy achievements of the State Department of Health may be recalled with interest at this time. The purity of food and medicines has been protected after the enactment of the food and drug law; there have been established modern sewerage systems; the sanitary conditions on the Charles river have been improved, and the Charles River Basin has been built; a metropolitan water supply system has been created; the study of sewerage problems has been promoted by the building of the Lawrence experiment station; a laboratory for the distribution of diphtheria antitoxin has been established; and health districts have been organized throughout the State for the improvement of hygienic and sanitary conditions.

#### MEDICAL NOTES.

##### SCANDINAVIAN CONGRESS ON PEDIATRICS.—

The first Scandinavian Congress on Pediatrics was held at Copenhagen on August 15 and 16. The classification and treatment of acute digestive disturbance in artificial feeding was one of the subjects discussed.

**CASUALTIES IN MEDICAL SERVICE.**—It has been announced recently by the Surgeon-General of the United States Army that 442 casualties occurred among the medical officers of the American Expeditionary Forces in France from July 1, 1917, to March 13, 1919. Of these, 22 died of wounds, 9 of accidents, 101 of disease; 46 were killed and 7 were missing in action; 4 were lost at sea. There were 36 prisoners unwounded, 47 wounded in action (degree undetermined); 93 severely wounded in action, and 72 slightly wounded.

**PROFESSORSHIP OF NEUROLOGICAL SURGERY.**—Dr. Ernest Sachs has been appointed professor of clinical neurological surgery at Washington University, St. Louis. This is the first case in which a medical school has recognized neurological surgery by creating for it a separate department.

**THE NURSE AND THE CAMPAIGN AGAINST CANCER.**—In a recent issue of *Campaign Notes*, the American Society for the Control of Cancer has emphasized the importance of promoting among nurses instruction regarding cancer. The Society has endeavored to secure the active coöperation of all nursing organizations, national, state, and local, of the leading training schools, and of individual nurses throughout the country. The Society has directed its efforts toward the provision of special instruction for pupil nurses and the actual participation of graduate nurses in the dissemination of the elementary knowledge of cancer among lay people generally, and particularly among women.

**TRUDEAU SANATORIUM.**—The thirty-fourth annual medical report of the Trudeau Sanatorium at Saranac, New York, including a medical supplement and Studies of the Edward L. Trudeau Foundation, summarizes the work which has been accomplished during the year. The war has not affected seriously the medical progress of the institution, for it has been possible to keep together practically the entire resident medical staff, because of the fact that most of its members have at some time been tuberculous. The clinical and x-ray work has been maintained as usual. The laboratory work has been somewhat retarded because of war conditions and the difficulty in obtaining suitable apparatus. Twenty-two physicians and medical students completed the course offered by the Trudeau School of Tuberculosis.

During the year 356 patients were treated at the sanatorium. Of 259 of these patients, 32 were discharged with the disease apparently arrested, 105 with disease quiescent, 34 improved, 41 unimproved, and 1 died. The condition of patients is recorded in tabular form in the Fourteenth Medical Supplement.

The following Studies of the Edward L. Trudeau Foundation are included in the report: "Heliotherapy in Tuberculosis," by E. Mayer, M.D.; "A Comparison of Physical Signs, Symptoms, and X-Ray Evidence Obtained in

Pulmonary Tuberculosis," by F. H. Heise, M.D., and H. L. Sampson; "A Tuberculosis Survey of the Residents of Saranac Lake," by F. B. Ames; "The Clinical Value of Complement Fixation in Pulmonary Tuberculosis Based on a Study of 540 Cases," by L. Brown, M.D., and S. A. Petroff; "A Glycerine 'Extract' of Tubercle Bacilli as an Antigen in Complement Fixation," by S. A. Petroff; "The Transfusion of Tuberculous Sheep with the Blood of Normal and Immunized Sheep, including a Study of Sheep Tuberculosis Controlled by the Complement Fixation Test," by E. Mayer, M.D., and D. J. Hurley, M.D.; and "A Study of Pulmonary and Pleural Annular Radiographic Shadows, together with Notes on Interlobar Fissures," by H. L. Sampson, F. H. Heise, M.D., and L. Brown, M.D.

**MEDICAL SERVICE OF NATIONAL TUBERCULOSIS ASSOCIATION.**—The National Tuberculosis Association will organize a medical service during the coming year. Dr. H. A. Pattison, Medical Field Secretary of the National Association, will be in charge of the entire service. The staff will include Mr. T. B. Kidner, formerly a member of the Federal Board of Vocational Education, and a public health nurse and medical field secretary.

**TYPHOID MORTALITY RATE.**—The seventh annual survey of the *Journal of the American Medical Association* shows that the number of deaths from typhoid has been decreased. The following table shows the mortality from typhoid fever per 100,000 of population in nine large cities:

	'18	AVERAGE '17	'11-'13
Chicago .....	1.4	1.7	8.2
Boston .....	2.5	2.9	8.0
Philadelphia .....	3.0	6.2	11.0
New York .....	3.7	4.0	8.0
Cleveland .....	4.7	7.1	10.0
St. Louis .....	7.2	7.5	12.1
Pittsburgh .....	9.8	11.2	15.9
Detroit .....	10.0	17.8	18.1
Baltimore .....	12.2	15.5	23.7

**TYPHUS IN POLAND.**—Two hundred American Army officers and men, forming a part of the sanitary mission being sent to Poland to fight typhus, are planning to travel through Germany by train as soon as equipment can be obtained.

**THE TREATMENT OF HAY FEVER.**—An article of interest and value to persons who suffer from hay fever has been published in a recent Public Health report. It is of primary importance to observe hygienic measures in controlling the disease. Homes should be selected in districts free from weeds, or if that is not possible, the Board of Health should be notified and the weeds cut down. Patients should avoid riding or driving in country abounding in weeds, and although exercise is beneficial, it should not be taken at the risk of increased exposure. Swimming, especially in salt water, is beneficial.

It has been discovered that rain dresses pollen of its toxic properties; a patient may therefore be protected by having the windows screened with the cloth saturated with water. When this method of screening is not practical, the patient may be provided with a special inhaling mask, based on the same principle.

The diet of hay-fever subjects during the hay-fever season should be light as regards food rich in protein, such as meat, fish, eggs, cheese, and milk; vegetables and fruit are beneficial. High seasoning and alcoholic drinks are injurious.

Surgical treatment may prove to be beneficial in cases having marked septal spurs, ridges, or deflections; and, although the percentage of cures from operations on these cases is not high (10 per cent.), they should not be overlooked in the prophylaxis of hay fever. Probably the electrocautery has been used more frequently than any other surgical method, but there are few cases which have been benefited by this treatment. Calcium chloride, calcium lactate, sodium bicarbonate, iodide, and mercury, have been found to afford some relief. Local treatment with menthol benefits some cases, but aggravates the attack in others. Nasal vibratory massage may be used for reducing the hypersensitiveness of the nostrils before the opening of the hay fever season and for correcting the intumescence of the nasal mucosa.

Experiments with pollen therapy have resulted in improvement in some cases, but better results are usually obtained by the combined use of pollen and vaccine therapy. Although the average results are satisfactory, this article points out that the number of seasonal cures may be considerably larger when the advantages of the preventive treatment of hay fever are better understood.



**RECURRENCE OF INFLUENZA.**—It has been reported that Health Commissioner William H. Peters of Cincinnati has expressed the belief that influenza will not recur in epidemic form this winter, although there will be some cases of influenza as there are every year. He believes that the nation has been to a great extent immunized, although the mortality rate may be expected to be high because any person whose resistance has been lowered may succumb to other diseases more readily. In order to protect these people, the American Red Cross, with the cooperation of the Board of Health, has established public health stations, where physical examinations will be made without charge.

**INFLUENZA IN MONTEVIDEO.**—A recent report from Montevideo states that in spite of the efforts being made by the Government and the Medical Association, influenza is still prevalent. The Uruguayan National Bureau of Hygiene is making plans for a Pan-American conference on influenza, and will invite the South American republics to send delegates to Montevideo in May, 1920.

**RED CROSS NURSES IN POLAND.**—The first detachment of American Red Cross Nurses who are being mobilized by the Polish ministry to teach American Health methods in Poland has arrived at Warsaw.

**NATIONAL COÖPERATION IN TUBERCULOSIS CONTROL.**—A bill has been proposed recently to create a division of tuberculosis in the United States Public Health Service, which would make possible government coöperation in the control of this disease. The returns of the United States Census Bureau for 1916, the latest figures available, show that tuberculosis caused 101,396 deaths in the registration district of the United States, a little more than 10 per cent. of all deaths. The draft examinations have shown the effect of tuberculosis as a factor in depreciating national power; of all examined, one in every twenty was found unfit for military service because of this disease. These facts show that there is urgent need for the National Government to take up the tuberculosis problem as an essential part of the reconstruction work.

The proposed bill not only establishes a new division, but provides for the creation of an advisory council for consultation with the

surgeon general of the service in regard to the scientific work to be inaugurated by the Service and the methods of performing it, and proposes that the present advisory board of the hygienic laboratory be abolished. It provides for an increase in the membership of the advisory board from eight to ten, and makes it possible for all branches of public health work to be represented on the board.

**ITALIAN MEDICAL ACHIEVEMENT.**—During the war, American physicians have learned to appreciate the greatness of Italy's medical achievement. The Ospedale Maggiore at Milan, for example, possesses an equipment for administering treatment by means of light which is probably equal to that of the St. Louis Hospital in Paris, which is regarded as the greatest hospital in the world for the treatment of affections of the skin. At Milan was founded the first hospital for foundlings. The Hospital for Occupational Diseases, the first of its kind, has been used as the model of similar institutions in this country. The laboratory of the University of Naples holds a leading place in work on kalaazar, the "black sickness" of India. It was this laboratory that first perfected the method of prophylaxis now used in typhoid. Genoa is a notable example of Italian preventive medicine and health education. Italy's medical schools, hospitals, laboratories, and methods of hygienic education indicate Italy's importance in the field of medical science, and are worthy of study by American physicians.

**CAUSE OF COLD FEET IN THE ARMY.**—The opinion has been expressed before the French Society of Biology that cold feet in the armies of the Allies was caused by the absence of sufficient vitamin in the food. It was observed that when vitamin substances are increased, this trouble disappeared.

**PATENT MEDICINE LEGISLATION.**—The House of Delegates of the American Pharmaceutical Association has passed a resolution recommending coöperation between the American Medical Association and the American Pharmaceutical Association in regard to the sale and manufacture of patent medicines. It is hoped that legislation similar to that which exists in Canada may be obtained to regulate patent medicines. The Fair Trade League proposition regarding

stable prices for standard commodities was re-indorsed by the House, and plans were outlined for securing federation of all state associations with the American Pharmaceutical Association.

### Correspondence.

#### NURSES FROM THE WALTHAM TRAINING SCHOOL.

West Newton, Mass.

Mr. Editor:—

For many years it has been my privilege to recommend to patients the nurses educated at the Waltham Training School.

I desire to bear testimony that these nurses have given satisfaction; that, in my opinion, they are second to none in their devotion to their patients, in their adaptability to the demands of private nursing, and in their endeavor to be of real service in all ways in the homes where sickness and sorrow have entered.

To say that such nurses are unworthy to serve as Red Cross nurses or in any public capacity, or that they are ineligible to membership in any society of nurses is such an unreasonable position that it is almost unbelievable.

My understanding of the Waltham Training School is that the stiffness of the course, the character of the training, and the thoroughness of it are such as to place its graduates above any criticism, according to present-day standards.

It would, I think, throw some light on a situation that is quite unbearable if the authorities of the Training School or Dr. Alfred Worcester would publish the record of positions of responsibility in hospitals and training schools which have been and are occupied by its graduates.

My impression is that this would show very well that these nurses have had the best sort of training.

FRANK M. SHERMAN.

#### RADIUM TREATMENT.

Boston, August 28, 1919.

Mr. Editor:—

The last two numbers of the JOURNAL have placed before your readers very interesting and valuable information on the use of radium as a weapon against disease in the hands of the surgeon. It would seem, however, that Dr. Greenough takes a much more conservative stand than does Dr. Bryant, but all must freely admit, yes, advocate, that in the use of so powerful a substance as radium, conservatism is of the utmost importance. And for the same reason, every bit of reliable information on this subject is of extreme value and should be widely published.

For several years, as a member of the radium staff at the Carney Hospital, and due to the courtesy of Prof. M. Douglas Flattery, the donor of the radium, the writer has had opportunity to test the efficacy of this powerful and mysterious element of nature along certain lines, and to such extent as the amount of the substance would permit, viz.: dermal and subdermal pathology as met with in warts, keloids, keratoses, naevi, localized anoid grouping (facial), obtrusive scar tissue, moles, sessile indurations, rodent ulcers, and epithelioma.

As a result of such experience I am very glad to state that, excepting one case of the last mentioned group, so far as I know, radium has been one hundred per cent. perfect, though many of the cases have required persistent treatment extending over a period of some months.

I will speak briefly of two cases—that of the mentioned failure in the epithelioma, and one other because of its peculiar character. In the former, owing to my not knowing that radium should never follow the use of the x-ray, my attempt to treat an epithelioma on the cheek of an elderly woman only made matters very much worse, the malignant process spreading out in all directions and the unfortunate victim, after a trial of the methods advocated at the Huntington Hospital, left for her family home in Canada to spend the few remaining months she had to live. Had this case been treated in the beginning by radium, there would have been no question about her prompt recovery.

The second case was that of a girl of twenty with a good family history, and herself, barring the local pathology, in perfect health. For something over three years she had been the distracted possessor of a recurrent crop of eruptions on her chin. This colony made its appearances very regularly every three weeks, but had no association with the menstrual periods. The eruptive points, some of them the size of a small pea, averaged about twelve in number. Of the group a certain proportion would abort, as it were, while the others would go on to breaking down stage, emitting a muco-purulent fluid and drying up promptly, the process existing about nine days. Because of the patient's occupation—an actress—this sort of thing was very embarrassing for her, and she had gone to great expense at the hands of dermatologists in her efforts to cure the disease. Coming to my office one day with another member of her company whom I was taking care of for a trouble having nothing to do with the skin, she incidentally called my attention to her own disability, which, just at that time, was in a state of activity. I made an appointment for a week later, when I applied five milligrams of radium, screened, for one half hour, and that ended the matter, there having been not the slightest evidence of the disease thereafter.

It is very unfortunate for all concerned that the cost of this unique surgical instrument is so great, and we hope that the time will come when existing methods for its release from the ore—I note that one of the writers refers to it under the orthography of canotite (It was my impression that this matrix was named for a President of France—Carnot.)—will have been perfected to such a degree as to permit its sale at a reasonable figure so that the profession can make general use of radium. As it is today, however, it would seem well nigh indispensable in the hands of dermatologists.

JAMES BROWN THORNTON.

### Miscellany.

#### SOCIETY NOTICE.

ESSEX NORTH DISTRICT MEDICAL SOCIETY.—The quarterly meeting of the Essex North District Medical Society will be held at the Wolfe Tavern, State Street, Newburyport, Wednesday, Sept. 24, 1919, at 2 P.M.

Dinner will be served at 2 P.M. Following the business meeting, these papers will be presented: Food Problems from a Hygienic and Economic Point of View, M. Victor Safford, M.D., of Boston, Past Assistant Surgeon, United States Public Health Service; and Food Problems from the Point of View of Administrative Control, William C. Woodward, M.D., of Boston, Health Commissioner of the City of Boston.

The next meeting of the Censors will be held Thursday, Nov. 7, 1919, at 2 P.M., at Hotel Bartlett, Haverhill. Applicants should present their diplomas to the Secretary at least one week before the date of meeting.

J. J. O'SULLIVAN, M.D., President,  
J. FORREST BURNHAM, M.D., Secretary.